Station Tethered Express Payload System

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Payload return opportunities from the *International Space Station* to Earth are now limited to the Shuttle, Soyuz, and Raduga. This traffic is being clustered to lengthen microgravity periods on the station, so payload return opportunities are often 2 to 3 months apart. This can be a severe constraint, especially on inherently iterative research and development projects. A NASA SBIR Phase II project is addressing this need for more frequent payload return with Station tethered express payload system(STEPS). STEPS uses Apollo-shaped capsules 78 cm in diameter with a payload capacity of 100 L (3.5 ft^3). STEPS is small enough to fit through the Japanese experiment module airlock allowing deployment without extravehicular activity. STEPS is both deorbited and oriented for reentry by a 2.5 kg expendable tether, so no rocket motor is needed. The tethered deorbit and "kite tail" orienting effect before reentry were both demonstrated on the first flight of the Small Expendable Deployer System (SEDS). The STEPS deployer is a small easily reloadable version of the SEDS deployer. It is part of a reusable ejector/deployer assembly that remains on the Station. The empty capsule plus its tether weigh 10 kg and take only 30 L of storage space. The ejector/deployer stow in a 20×40×100-cm volume. A STEPS precursor flight is planned as a Delta secondary payload. It will test the heat shield, modified SEDS deployer, tether control law, and a soft mid-air recovery technique.

Sponsor: NASA Headquarters, Small Business Innovation Research Program

Biographical Sketch: Charles Rupp is a senior engineer in the Advanced Systems and Technology Office of Program Development and has been working on space tethers since 1975. He helped develop the tethered satellite system and the small expendable deployer system. He also helped provide hardware and software for the plasma motor/generator tether mission flown by the Johnson Space Center and the tether physics experiment flown by the Naval Research Center. Rupp received his BSEE and MSEE degrees from Auburn University in 1961 and 1964 and has been employed by the Marshall Center since 1964.

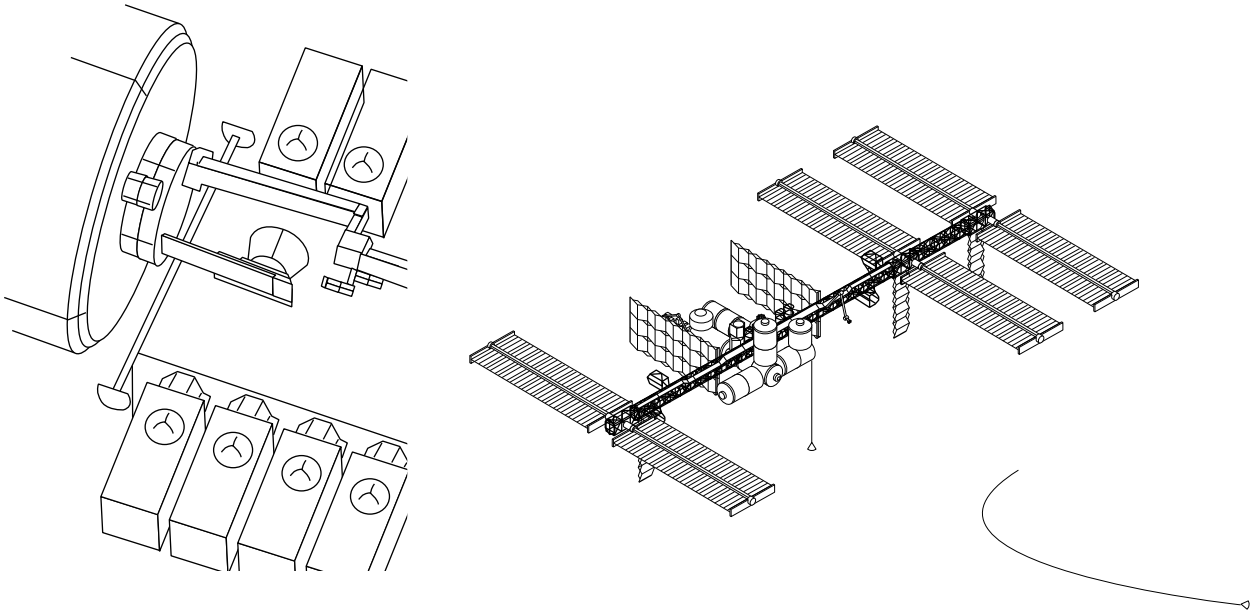

FIGURE 183.—STEPS deployment from *International Space Station.*